

REMARKSStatus of the claims:

With the above amendments, claim 1 has been amended and claims 11-12 have been added. No new matter has been added by way of the above amendments. Claim 1 has been amended by changing the phrase "does not contain any styrene" to "is substantially free of styrene". Claim 11 has support at page 11, lines 15-18. Claim 12 has support at page 1, lines 6-10. Thus, claims 1-8 and 11-12 are pending and ready for further action on the merits. Reconsideration in light of the following remarks is respectfully requested.

Amendment to claim 1

Applicants wish to explain the amendment to claim 1. Applicants herein submit a reference from the "ENCYCLOPEDIA OF CHEMICAL TECHNOLOGY" wherein the difference between a polyester and a polyester resin is described. At page 575, lines 4-6 it is described that "Solutions of these polymers in vinyl monomers, eg. styrene, often are called polyester resins. They are compounded with filler or fibers, of both, in the liquid stage . . ." Thus, one of skill in the art would readily understand the difference between "polyesters" and "polyester resins".

With this difference in mind, one would recognize that it is the added monomer, i.e., styrene, that the Applicants of the instant invention want to avoid. Thus, the language "substantially free of styrene" refers to the added monomer.

Rejections under 35 USC §102/103

Claims 1, 2, and 6-10 have been rejected under 35 USC §102 (b) as being anticipated by Osborne '895 (US Patent No. 4,895,895) or in the alternative claims 1-10 have been rejected under 35 USC §103 (a) as being unpatentable over Osborne '895.

Claims 1-10 have been rejected under 35 USC §102 (b) as being anticipated by, or in the alternative under 35 USC §103 (a) as being unpatentable over Van Gasse '234 (US Patent No. 5,212,234).

These rejections are traversed for the following reasons.

Present Invention

The present invention, as recited in claim 1, relates to a molding composition comprising (A) a fibrous material, (B) a crystalline unsaturated polyester, (C) a non-crystalline unsaturated polyester, and (D) a radical generator, and wherein said composition is substantially free of styrene.

Disclosure of Osborne '895

Osborne '895 discloses a thickened molding composition that comprises fibrous reinforcement, an ethylenically unsaturated polymer, a monomer copolymerizable therewith and a crystalline unsaturated polyester having a glycol component derived from at least two symmetrical glycols. Preferably, the crystalline polyester of Osborne '895 has a molecular weight per double bond of no more than about 210 and a melting point of from 50°C-115°C.

Osborne '895 fails to disclose any examples wherein the composition is substantially free of styrene.

Disclosure of Van Gasse '234

Van Gasse '234 discloses a molding compound based on thermosetting resin material and optionally fibers, fillers, curing catalysts and further usual additives. The molding composition is characterized in that the molding compound comprises a mixture of at least two thermosetting resins of which a first resin is in a partly cured state, and of which a second resin is not, or less than the first resin in a partly cured state.

Van Gasse '234 fails to disclose any examples wherein the composition is substantially free of styrene.

Removal of the Rejections over Osborne '895 and Van Gasse '234

The Examiner in the Advisory Action of July 24, 2002 says:

The 35 USC 102 (b) and 103 (a) rejections over each of Osborne and Van Gasse are maintained. While the references do not contain examples without styrene, at col. 3, lines 33-37 of Osborne and col. 3, lines 4-9 of Van Gasse, each of the references exemplifies a small group of unsaturated monomers other than styrene. Thus, use of a monomer other than styrene is anticipated by each of the references of [SIC, or] would have been obvious as suggested by the references.

With respect to the arguments concerning unexpected results, a composition that does not contain styrene would be expected not to have the odor of styrene.

Sakai (col. 1, lines 13-18) and Fujita (col. 1, lines 14-46) cited to show the art recognized odor problem when using styrene.

Applicants assert that the anticipation rejections over Van Gasse '234 and Osborne '895 are being improperly applied. It has been held that "a claim is only anticipated if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference". See *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). Moreover, "the single reference must describe and enable the claimed invention, including all claim limitations, with sufficient clarity and detail to establish that the subject matter already existed in the prior art and that its existence was recognized by persons of ordinary skill in the field of the invention." See *Elan Pharmaceuticals Inc. v. Mayo Foundation for Medical Education and Research*, 64 USPQ2d 1292, 1296 (Fed. Cir. 2002) (citing

Crown Operations International, Ltd. v. Solutia Inc., 289 F.3d 1367, 1375, 62 USPQ2d 1917, 1921 (Fed. Cir. 2002); *In re Spada*, 911 F.2d 705, 708, 15 USPQ2d 1655, 1657 (Fed. Cir. 1990).

Accordingly, Applicants assert that the use of Sakai '619 (US Patent No. 5,851,619) and Fujita '597 (US Patent No. 5,747,597) to show that it is recognized in the art that styrene has a smell problem is incorrect. Van Gasse '234 and Osborne '895 have not described and enabled the claimed invention, including all claim limitations, with sufficient clarity and detail to establish that the subject matter already existed in the prior art and that its existence was recognized by persons of ordinary skill in the field of the invention. Nowhere in Van Gasse '234 or Osborne '895 is there a single suggestion of not using styrene to avoid the smell of styrene. All of the examples that are made in Van Gasse '234 and Osborne '895 contain styrene. One of the requirements of obtaining a patent is that the inventor describe the "best mode" of the invention contemplated by the inventor at the time of filing the invention. Because all of the examples in Van Gasse '234 and Osborne '895 disclose styrene in the composition, one can infer that using styrene was the "best mode" the inventors (i.e., the inventors in Van Gasse '234 and Osborne '895) contemplated at the time of filing their application. Thus, with only slightly more inference, it should be apparent that Van Gasse '234 and

Osborne '895 did not consider getting rid of styrene in order to reduce the smell.

The Examiner has cited a passage at column 3, lines 4-9 in Van Gasse '234 that recites ethylenically unsaturated monomers other than styrene. This passage says:

Examples of alkenically unsaturated monomers are styrene, substituted styrenes such as vinyl toluene or tert-butylstyrene, (C₂-C₄) -alkylesters of acrylic acid and methacrylic acid, α -methyl styrene, cyclic acrylates and methacrylates, halogenated styrenes, 1-3 butanedioldimethacrylate and diallyl phthalate.

It is noted that in this passage there are both styrene-containing monomers and non-styrene-containing monomers. Thus, it appears that Van Gasse '234 does not differentiate between those monomers that contain styrene and those that do not. Thus, one could argue that Van Gasse '234 did not recognize the advantages in avoiding using styrene in the compositions disclosed in Van Gasse '234. Further, the fact that all of the exemplary compositions in Van Gasse '234 all contain styrene would lead one to believe that the inventors in Van Gasse '234 believed that Van Gasse '234 was the best mode of practicing their invention.

The Examiner, however has cited the later filed and later patented Sakai '619 and Fujita '597 references to show that this is an art recognized problem. However, from the disclosures of Van Gasse '234 and Osborne '895, it was apparent that the

inventors in Van Gasse '234 and Osborne '895 did not recognize the problems associated with styrene when they filed their applications. Thus, the anticipation rejections over Sakai '619 and Fujita '597 are improperly applied due to this temporal problem.

Moreover, the use of Sakai '619 and Fujita '597 as a secondary reference in an anticipation rejection is inapposite for other reasons. Courts have held that a secondary reference in an anticipation rejection can be used 1) to prove that the primary reference contains an enabled disclosure, 2) to explain the meaning of a term used in the primary reference, or 3) to show that a characteristic not disclosed in the reference is inherent. See MPEP 2131.01. The Examiner's use of Sakai '619 and Fujita '597 does not fall within any of these uses for a secondary reference in an anticipation rejection. Accordingly, Applicants submit that an anticipation rejection cannot be used.

Regarding the obviousness rejections over Van Gasse '234 and Osborne '895, Applicants traverse the rejection. In the reply filed July 8, 2002, Applicants argued that the absence of styrene in the instant invention provided unexpected results over Van Gasse '234 and Osborne '895. The Examiner, however, said that compositions that do not contain styrene would not be considered to have the smell of styrene. Applicants point out that all of the Examples that are present in Van Gasse '234 and

Osborne '895 contain styrene. Thus, Van Gasse '234 and Osborne '895 apparently did not recognize that styrene had smell problems associated with it. Otherwise, Van Gasse '234 and Osborne '895 would have made their compositions without styrene. Accordingly, Applicants assert that in view of Van Gasse '234 and Osborne '895, a composition that does not contain styrene produces results that are unexpected.

Moreover, the instant invention is directed to resin reinforced fiber whereas both Van Gasse '234 and Osborne '895' are directed to fiber reinforced resins. The fiber reinforced resin is a resin structure in which the strength of the resin is reinforced by formulating fiber or the like into the resin. In contrast, the resin reinforced fiber is a fibrous structure in which the binding force between the fibers or the like is strengthened by the resin. In other words, the continuous phase of the former is the resin, while the continuous form of the latter is the fiber. More specifically, the former can be used to build, for example, a bathtub, whereas the latter is typically used, for example, the core material in the interior decoration of an automobile.

The methods of manufacturing a fiber reinforced resin and a resin reinforced fiber also differ. The fiber reinforced resin is manufactured by the steps of providing a polyester and a liquid monomer, such as styrene or the like. In manufacturing

the fiber reinforced resin, the liquid monomer is essential for dissolving a resin to obtain a putty composition with a high viscosity, in which fibers or a thickener is added. This intermediate is placed in a die and molded and heated to harden it to obtain a desired product such as a bathtub. The intermediate may be used in sheet form (i.e., a sheet molding compound (SMC)). For the Examiner's benefit, please find attached to this response a description about the SMC method described at page 590 in the "ENCYCLOPEDIA OF CHEMICAL TECHNOLOGY". In this description, it can be seen that putty is spread out to form a compound in sheet form. Alternatively, the intermediate may be used in bulk, rod, or pellet form (called a bulk molding compound (BMC)). IN the BMC process, the putty is used by shaping in a wet process or is shaped like an extruded rod or a pellet using an extruder or a similar instrument.

The SMC process cannot be used to make the articles of the instant invention (as claimed in claim 12).

In contrast to the fiber reinforced resin, the resin reinforced fiber is prepared by formulating polyester powder to be solidified at room temperature into fibers, and hardening polyester placed at the intersection of fibers under heat or some similar condition to improve the strength of a fiber board.

If the resin used is a resin of low molecular weight, which can be dissolved in a liquid monomer such as styrene, then it is

not suitable for use in the present invention in terms of strength.

The methods of manufacturing the resin reinforced fiber composition versus the fiber reinforced resin composition must be kept in mind because one composition provides certain properties that are superior to the properties disclosed in the other composition, even though there may be overlap between the components in the compositions.

For the above reasons, Applicants assert that the rejections have been obviated. Withdrawal of the rejections is warranted and respectfully requested.

Pursuant to 37 C.F.R. §§ 1.17 and 1.136(a), Applicant(s) respectfully petition(s) for a five (5) month extension of time for filing a reply in connection with the present application, and the required fee of \$1,970.00 is attached hereto.

With the above remarks and amendments, it is believed that the claims, as they now stand, define patentable subject matter such that a passage of the instant invention to allowance is warranted. A Notice to that effect is earnestly solicited.

If any questions remain regarding the above matters, please contact Applicant's representative, T. Benjamin Schroeder (Reg. No. 50,990), in the Washington metropolitan area at the phone number listed below.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

Respectfully submitted,

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Attachment: ENCYCLOPEDIA OF CHEMICAL TECHNOLOGY reference

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS

Claim 1 has been amended as follows:

1. (Three Times Amended) A molding composition comprising (A) a fibrous material, (B) a crystalline unsaturated polyester, (C) a non-crystalline unsaturated polyester, and (D) a radical generator, and wherein said composition is substantially free of [does not contain] styrene.

Claims 11-12 have been added.



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ENCYCLOPEDIA OF CHEMICAL TECHNOLOGY

THIRD EDITION

VOLUME 18

PLANT-GROWTH SUBSTANCES
TO
POTASSIUM COMPOUNDS



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POLYESTERS, UNSATURATED

Unsaturated polyesters are macromolecules with polyester backbones derived from the interaction of unsaturated acids or anhydrides and polyhydric alcohols (see Alcohols, polyhydric). The reaction normally proceeds at 190–220°C until a predetermined acid value–viscosity relationship has been achieved. Solutions of these polymers in vinyl monomers, eg, styrene, often are called polyester resins. They are compounded with fillers or fibers, or both, in the liquid stage and then are cured with the aid of free-radical initiators (qv) to yield thermoset articles. Market penetration, especially in the area of fiber-glass reinforcement, is greatly enhanced as a result of greater latitudes in compounding and processing than is possible with other polymeric systems. Unsaturated polyesters can be mass-cast, laminated, molded, pultruded, and made into gel coats in a variety of colors. Depending on the application, the physical and chemical properties of the product often can be met by judicious choice of polyester backbone ingredients and the type and amount of the diluent vinyl monomer.

Polyester resins are considered one of the three principal thermoset systems of economic importance. The other two are phenolics and epoxy resins (qv) (see Phenolic resins).

Properties

To a great extent, physical properties are the credentials that qualify the application of a material. Although both chemical and physical properties are rigorously tested and evaluated, physical properties are quantified more easily since the test methods are standardized and are related easily. Table 1 lists the physical properties of polyester resins that usually are evaluated and the corresponding, recommended ASTM testing method. The physical properties of a cured polyester resin is interrelated to a certain degree with the structural features of the three-dimensional network.

Table 1. Physical Test Procedures for Cured Polyester Resins

Properties	ASTM no.
tensile strength, modulus, % elongation	D 638
flexural strength, modulus	D 790
compressive strength, modulus, % compression	D 695
on break	
torsion	D 1043
shear	D 732
stiffness	D 747
Izod impact	D 256
tensile impact	D 1822
heat distortion	D 648
Rockwell hardness	E 18-31 and D 785
Barcol hardness	D 2583
water absorption	D 570
water-vapor transmission	C 355
specific gravity	D 792
Taber abrasion	D 1044

fiber-glass strands onto the gel coat and is allowed to cure. A serrated roller usually is used to squeeze the resin into the glass strands to ensure that the glass fibers are completely wetted by the resin and to expel any entrapped air. This is especially important if a glass cloth or a preformed chopped strand mat is used for reinforcement. Because sprayup is carried out over various geometries, sag resistance over vertical areas is important.

In the continuous process, the resin is placed in a large tank and is compounded with proper fillers, pigments, promoters, and auxiliary stabilizers or accelerators, as required. Then the resin is pumped continuously into a small chamber where it is mixed with a free-radical initiator and dispensed onto a plastic protective film over a moving conveyor belt. Continuous glass strands or rovings are pulled and mechanically chopped over the moving layer of resin. Another protective film is draped over the glass layer and the uncured composite is passed through tensioning bars to ensure good glass wetout before oven curing. After the curing step, the protective films are removed and the cured sheet stock is cut to specified lengths.

In the filament-winding process, the continuous glass rovings are guided into a catalyzed-resin-filled tank and passed through small orifices for removal of excess resin. The strands are helically wound onto a rotating mandrel. Either chopped strands or glass in the form of woven roving is applied to the rotating part to ensure against weak spots. The part is rolled into a large oven and is cured. The inner core of the structure collapses and is pulled out of the outer shell. The ends of the structure usually are fabricated by a wet layup process followed by placing the mold into a press where it is cured under mild heat and pressure.

Molding. The compression-molding of unsaturated polyesters and, specifically, of sheet-molding compounds (SMCs) has been gaining importance as reflected by the increased usage of these compounds in automotive applications. The greatest potential for SMC is in the area of automotive exterior-skin application, eg, grill-opening panels, fenders, decklids, hoods, and door skins; their use is intended to reduce automobile weight. Molding compounds containing high levels of glass fibers deliver a high strength-to-weight ratio. Sheet-molding compounds normally contain a polyester resin of high fumarate content, fillers, high temperature initiators, thermoplastics to prevent or lessen the amount of shrinkage, and thickeners. These ingredients are mixed in suitable proportions and subsequently mixed in an SMC machine with chopped glass fibers. Typical machines are illustrated in Figures 2 and 3. The roll of compound is stored until it achieves a high viscosity, ie, $(15-70) \times 10^6$ mPa-s (= cP), and is sliced and molded under high pressure and temperature to yield parts with smooth and glossy surfaces.

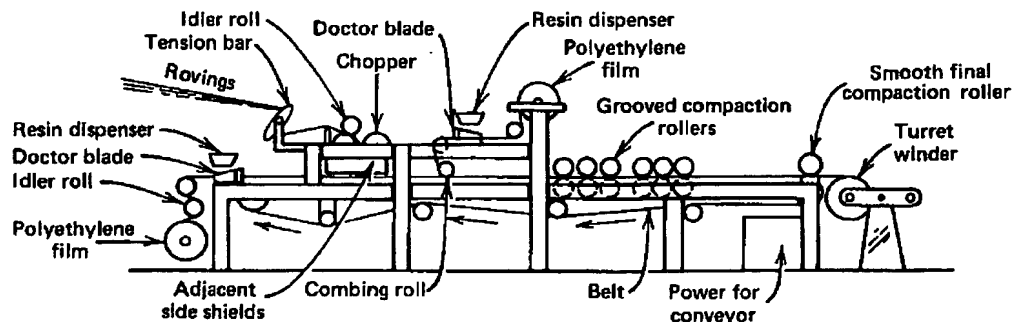


Figure 2. Belt-type SMC machine.

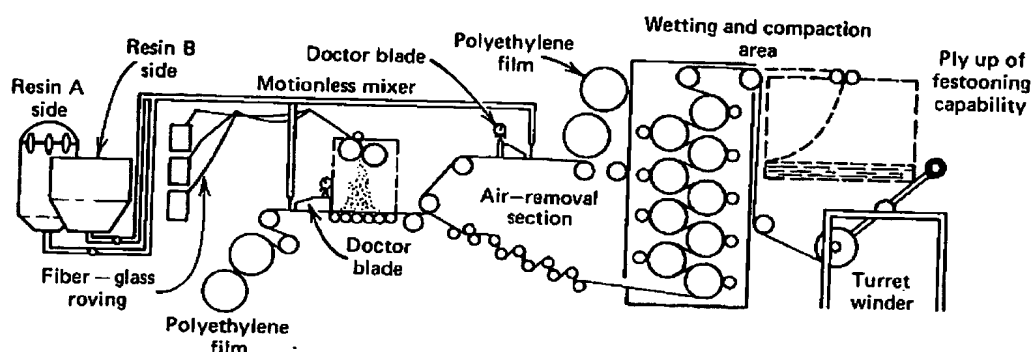


Figure 3. Stack-roll SMC machine.

The majority of thickeners used in SMCs are the oxides or hydroxides of calcium, magnesium, and zinc (44–45). Although the rate and extent of thickening depends greatly on the acid value of the resin mix and the type and amount of thickeners used, certain organic amide thickening-control agents have been used to speed the thickening reaction and to maintain the desired viscosity for long periods (46). Dual thickening of SMCs has been achieved by using alkaline-earth oxides in combination with either isocyanates or certain metal halides (47–48). Because very low or very high viscosities are detrimental to the handling or molding of the compound, it is extremely important to devise methods to control the amount of added thickening agent. One such method is based on colorimetric measurement (49).

A wide variety of thermoplastic components is effective in controlling the shrinking of the molded compound and in giving smooth and glossy surfaces (50–57). Components can be rubber compounds, polyacrylates, poly(vinyl acetate)s, polyesters, polyethers, and various combinations of these. Some of the thermoplastics are miscible with the base resin and others are not. Certain thermoplastics are efficient if they are anchored to the matrix resin by free-radical polymerization during the cure cycle.

Free-radical polymerization initiators that normally are used in curing SMCs are those that have 10-h half-lives at or above 100°C. *tert*-Butyl perbenzoate is the most commonly used. The optimum molding-temperature range with this initiator is 140–150°C; although higher temperatures can be used to effect shorter cure times. Similarly, the use of peroxides with lower decomposition temperatures can be used for similar purposes.

Fillers used in sheet molding compounds should be free of metal oxides or hydroxides which can cause uncontrollable thickening reactions. Calcium carbonates of various particle sizes and several types of clays have been used.

Injection-molding compounds of unsaturated polyester resins usually are prepared with a lower content of short glass fibers and at considerably lower matured viscosities than SMCs. These compounds are injected into a mold cavity by mechanical delivery systems and are molded at low pressures. Part appearances are often superior to those obtained with SMCs; however, they lose strength because of the degradation of the glass fibers during bulking and injection steps. Further drawbacks include the wear of runners and gate areas resulting from abrasion by glass fibers.

Other Specialty Resins. Ideally, any polyester resin that is chosen for an application and performs well where others fail is considered a specialty resin as compared to commodity or general-purpose resins. Either by their construction or formulations, specialty resins display unique properties or environmental resistances that cannot be easily matched.